

I Claim:-

1. Carbon dioxide recirculating apparatus for an arrangement having combustion means and a path for a flow
5 of gas through the combustion means, the apparatus comprising extraction means for extracting gaseous carbon dioxide from a first region of the path downstream of the combustion means, condensing means for condensing the extracted carbon dioxide, and feed means for feeding the
10 condensed carbon dioxide to a second region of the path upstream of the combustion means.
2. Carbon dioxide recirculating apparatus according to Claim 1 wherein the condensing means comprises heat removal means, to remove heat from the extracted carbon dioxide,
15 and compressor means to compress the extracted carbon dioxide, the compressor means being arranged between the extraction means and the heat removal means.
3. Carbon dioxide recirculating apparatus according to Claim 2, wherein the heat removal means comprises cooling
20 means to cool the compressed carbon dioxide.
4. Carbon dioxide recirculating apparatus according to Claim 1, wherein the feed means comprises spray means to spray the condensed carbon dioxide into the second region of the path to form a fog of the carbon dioxide.
- 25 5. Carbon dioxide recirculating apparatus according to Claim 4, wherein the spray means comprises atomising means.
6. Carbon dioxide recirculating apparatus according to Claim 5, wherein the atomising means comprises a nozzle.
7. A combustion arrangement comprising combustion means,
30 a path for a flow of gas through the combustion means and carbon dioxide recirculating apparatus as claimed in claim 1.
8. An arrangement according to Claim 7, wherein the arrangement is in the form of a heat engine or a fuel cell.
- 35 9. An arrangement according to Claim 8, wherein the heat engine comprises a gas turbine engine having a compressor

region in the path upstream of the combustion means and a turbine region in the path downstream of the combustion means.

10. An arrangement according to Claim 9, wherein the
5 extraction means is arrangeable to extract carbon dioxide from the exhaust gases downstream of the turbine region.

11. An arrangement according to Claim 9, wherein the feed means is arrangeable to feed condensed carbon dioxide to the compressor region.

10 12. An arrangement according to Claim 9, wherein the compressor region comprises first and second compressors arranged in the path in axial flow series, and the feed means is arranged to feed the condensed carbon dioxide to one or more of: the inlet to the compressor region; between
15 the first and second compressors; and the outlet of the compressor region.

13. An arrangement according to Claim 9, wherein the engine includes a heat exchanger to exchange heat between gas entering the combustion means and heat exhausted from
20 the combustion means, and the feed means is arranged to feed at least some of the condensed carbon dioxide to the outlet of the compressor region upstream of the heat exchanger.

14. An arrangement according to Claim 13, wherein the
25 compressor region comprises first and second compressors and the feed means is arranged also to feed some of the condensed carbon dioxide between the first and second compressors and/or to the inlet of the compressor region.

15. A combustion arrangement according to Claim 7
30 including a fuel cell assembly to receive carbon dioxide from the carbon dioxide recirculating apparatus.

16. A combustion arrangement according to Claim 15, wherein the fuel cell assembly comprises a cathode to receive carbon dioxide from the carbon dioxide
35 recirculating apparatus and an anode, the exhaust from the anode being passed to the carbon dioxide recirculating

apparatus.

17. A combustion arrangement according to Claim 16 comprising a compressor for receiving recirculated carbon dioxide and for compressing gases prior to said gases being
5 passed to the cathode.

18. A combustion arrangement according to claim 16 or 17, wherein recirculated carbon dioxide is passed to the anode.

19. A combustor arrangement according to Claim 17 or 18 including a turbine driven by gases exhausted from said
10 cathode, the turbine being arranged to drive the compressor.

20. A combustor arrangement according to Claim 19, wherein the turbine comprises a free power turbine driven by gases exhausted from a principal turbine.

15 21. A combustor arrangement according to Claim 20, wherein the principal turbine is driven by gases exhausted from the cathode, and the arrangement further includes a principal compressor driven by the principal turbine, the principal compressor receiving recirculated carbon dioxide and
20 compressing gases prior to said gases being passed to the cathode.

22. A method of recirculating carbon dioxide from a flow of gas through an arrangement comprising combustion means and a path for the flow of gas through the combustion
25 means, the method comprising extracting carbon dioxide from a first region downstream of the combustion means, condensing the extracted carbon dioxide and thereafter feeding the condensed carbon dioxide to a second region upstream of the combustion means.

30 23. A method according to Claim 22, wherein the step of condensing the extracted carbon dioxide comprises providing heat removal means to remove heat from the carbon dioxide and compressing the carbon dioxide prior to removing said heat from the carbon dioxide.

35 24. A method according to Claim 23, wherein the heat removal means comprises cooling means to cool the carbon

dioxide to effect said condensation thereof.

25. A method according to Claim 22, wherein the step of feeding the condensed carbon dioxide to the second region of the engine comprises spraying the condensed carbon dioxide to the second region to form a fog of the carbon dioxide in the second region.

26. A method according to Claim 22, wherein the step of feeding the carbon dioxide to the second region of the arrangement comprises atomising the condensed carbon dioxide.

27. A method according to Claim 22, wherein the arrangement comprises a heat engine or a fuel cell.

28. A method according to Claim 25, wherein the engine is a gas turbine engine comprising a compressor region upstream of the combustion means, and a turbine region downstream of the combustion means, and the step of extracting carbon dioxide comprises extracting carbon dioxide downstream of the turbine region.

29. A method according to Claim 28, wherein the step of feeding the carbon dioxide to the second region of the path comprises feeding the carbon dioxide to the compressor region of the engine.

30. A method according to Claim 28, wherein the compressor region comprises first and second compressors arranged in axial flow series in the path, and the step of feeding the carbon dioxide to the second region of the path comprises feeding the carbon dioxide to one or more of: the inlet of the compressor region; between the first and second compressors; and to the outlet of the compressor region.

31. A method according to Claim 28, wherein the engine may comprise a heat exchanger to exchange heat between gas entering the combustion means and gas exhausted from the combustion means, and the step of feeding the condensed carbon dioxide to the second region comprises feeding the carbon dioxide to the outlet of the compressor region.

32. A method according to Claim 31, wherein the compressor

region comprises first and second compressors and the step of feeding the condensed carbon dioxide to the compressor region also includes feeding some of the condensed carbon dioxide between the first and second compressors and/or to
5 the inlet of the compressor region.